REGIONAL GRADUATE STUDENT, POST-DOC, AND EARLY CAREER RESEARCHER TRAINING II

FINAL REPORT

DEPARTMENT OF INTERIOR CLIMATE SCIENCE CENTERS
ANNUAL FUNDING FOR FISCAL YEAR 2015

1. ADMINISTRATIVE:

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2. PUBLIC SUMMARY:

Led by members of the South Central Climate Science Center (SC CSC) consortium, this project developed and implemented a professional development training for graduate students, post-docs, and early career environmental professionals conducting climate-related research associated with the south-central U.S. The project built upon the successes and feedback from a similar training conducted in June 2014. The training (1) introduced a new cohort of early career researchers to the goals, structure, and unique research-related challenges of the SC CSC and its place within the U.S. Department of the Interior and the larger CSC network, offering them insight into how their research fits into the broader research priority goals and its eventual applicability to end-user needs across the region; (2) facilitated interdisciplinary interactions between participants within the SC CSC purview in an effort to discuss research with peers and foster collaborative opportunities; and (3) generated a syllabus and specific curricular materials designed for a formal classroom setting. Curricular materials include an additional set of digitally recorded presentations on the SC CSC enterprise to supplement those created during the 2014 training and an updated version of the "how to" guide for conducting a similar training. A major outcome of the training was the development of a cohort of early career professionals who can continue networking through their research pathways and who can understand and eventually lead outcome-oriented, interdisciplinary research. This experience for the participants is anticipated to help remove some of the institutional barriers, or "silos," at an influential time in the development of these professionals so that they can better navigate multi-institutional and multi- or inter-disciplinary research. It is also expected to contribute to the development of better

communication and collaboration practices for the long-term benefit of the CSCs, Landscape Conservation Cooperatives, and their partners.

3. TECHNICAL SUMMARY:

Led by members of the South Central Climate Science Center (SC CSC) consortium, this project developed and implemented a one week professional development training for graduate students, post-docs, and early career environmental professionals conducting climate-related research associated with the south-central U.S. The goals were to: (1) introduce a new cohort of early career researchers to the goals, structure, and unique research-related challenges of the SC CSC and its place within the U.S. Department of the Interior and the larger CSC network, offering them insight into how their research fits into the broader research priority goals and its eventual applicability to end-user needs across the region; (2) facilitate interdisciplinary interactions between participants within the SC CSC purview in an effort to discuss research with peers and foster collaborative opportunities; and (3) generate a syllabus and specific curricular materials designed for a formal classroom setting.

Each of the stated project objectives was met through the careful construction of the training agenda. The training was held June 19-24, 2016 at SC CSC Consortium Member institution, Texas Tech University in Lubbock, TX and was comprised of: (1) a series of instructional presentations organized into themed sessions (e.g., introduction of the SC CSC and its partner members, early career professional development and interdisciplinary research, climate change science and impacts, Indigenous knowledge, science communication, and stakeholder engagement) that met the goal of introducing the participants to the SC CSC and it's research and applicability; (2) two keynote addresses to provide a broader perspective of stakeholder-based climate science research that met the goal of providing insight on the applicability of research to end-user needs; (3) participant small group projects/presentations on interdisciplinary proposal team development that met the goal of facilitating interdisciplinary research; and (4) field trips throughout the week showcasing how scientific results are used in the decision-making process that met the goal of providing insight on the applicability of research to end-user needs. In addition, we purposely created informal opportunities for participants to network, which met the goal of facilitating interdisciplinary interactions.

This project advanced science within the SC CSC region by developing a cohort of early career professionals who can continue networking through their research pathways and who can understand and eventually lead outcome-oriented, interdisciplinary research. Participating individuals gained insight into how their research fits into the broader research priority goals of the SC CSC enterprise and its eventual applicability to end user needs across the region. This experience also removed some of the institutional barriers, or "silos," at an influential time in the development of these professionals so that they can better navigate multi-institutional and multi- or inter-disciplinary research. Because of the high quality of the early career participants, they are already taking a leadership role in communicating science amongst the consortium members, Landscape Conservation Cooperatives (LCCs), and their partners and contributing to the development of better communication and collaboration practices for the long-term benefit of the SC CSC enterprise. In fact, participants from TTU, after discussions at the workshop, are developing a project with those from LSU on analyzing soil temperature variability as potential mechanisms for observed vegetation changes along the Gulf Coast. And a number of participates

from both this training and from the 2014 training attended the All-CSC Early Career Training that was held this year in Amherst, MA. Other participants have become active in the Early Career Climate Forum (https://www.eccforum.org/).

4. PURPOSE AND OBJECTIVES:

4.1 Project Intent

The Department of the Interior Climate Science Centers were established under Secretarial Order 3285 (2010) with the purpose of addressing the impacts of climate change on America's water, land, and other natural and cultural resources. This Order states that it is imperative that "scientists work in tandem with those managers who are confronting climate change impacts." These Climate Science Centers established a new paradigm for conducting actionable research through interdisciplinary collaborations, and the community that this funded project served was early career researchers, who were educated to operate within this paradigm from the start of their careers.

There are many challenges to conducting inter- or multi-disciplinary research because basic research, applied research, management processes, disciplines, and even sub-disciplines have been "siloed" for so long that many research and management professionals find it difficult to communicate common interests and research needs. It is clear that the next generation of researchers must overcome these disciplinary biases and engage in more open dialogue with other disciplines and the management community in order to be better positioned to collaborate, speak a common language, and understand each other's needs.

Through this training, early career researchers in natural and social sciences (as related to climate) met and interacted with high quality established researchers as well as their fellow peers involved in a diverse array of fields and managers and other potential end-users of their research. We educated researchers early in their careers on how to overcome the identified challenges in conducting and communicating "actionable" research and helped them to build a network of peers through which they could continue to pursue collaborations. The training has contributed substantially to developing better communication and collaboration practices for the long-term benefit of the CSCs, LCCs, and their partners.

4.2 Project Objectives

The primary objective of this project was to build upon the success of the 2014 event to develop and implement a training for graduate students, post docs, and early career environmental professionals conducing climate-related research associated with the south-central U.S. The one-week training was to focus on professional development of a cohort of early career professionals who could continue networking through their research pathways and who could understand and eventually lead outcome-oriented, interdisciplinary research. A high priority was to invite a group of participants diverse in research topics, disciplines, gender, ethnicity, cultural backgrounds, and geographic location within the SC CSC region. The three major goals of this project are described above in Section 3 of this report. We met our objectives by hosting a one-week training from June 19-24, 2016 at Texas Tech University in Lubbock, TX with 23 attendees (disaggregated as: 13 White, 3 Asian, 2 African American, 1 American Indian/Alaska Native, and 4 unspecified; 18 Not Hispanic or Latino, 2 Hispanic or Latino, and 3 unspecified; 10 female and 13 male) from the four consortium universities, Texas A&M University,

University of Arizona, Colorado State University, USDA Grazinglands Research Laboratory, USGS Fort Collins Science Center, and Great Plains Landscape Conservation Cooperative.

All major objectives were met – as described in further detail in Sections 5 and 6 of this report.

5. ORGANIZATION AND APPROACH:

The Early Career Researcher Training was held on June 19-24, 2016 at SC CSC Consortium member institution Texas Tech University (TTU) in Lubbock, TX. Holding the training at TTU provided an opportunity to showcase a different set of expertise within the SC CSC and allowed for enhanced diversity of content material, speakers, management agencies, landscape types, and organizations in order to complement the 2014 training event held at the University of Oklahoma in Norman, OK.

A competitive application process was used for selecting the training participants with a requirement that applicants be graduate students, post-docs, or early career environmental professionals within five years of having graduated and actively conducting research or synergistic activities applicable to the south-central U.S. region. Applicants were asked to provide a description of their research, synergistic activities, and background with a requirement that their research correspond to at least one of the three science priorities outlined in the FY 2015 RFP for the SC CSC: regional and physical climate variability and trends, ecosystems and landscapes, and human dimensions. Applications were graded by three independent reviewers (project PIs) using multiple metrics to identify the most competitive applicants.

A high priority was to invite a group of participants diverse in research topics, disciplines, gender, ethnicity, cultural backgrounds, and geographic location within the SC CSC region. There were 28 applications received – all of which were deemed acceptable for the training and provided acceptance invitations. Five of the individuals backed out of attending at various stages prior to the training leaving a total of 23 participants (refer to Participant_List_2016.pdf), which included representation from Louisiana State University (5), University of Arizona (3), University of Oklahoma (3), Oklahoma State University (3), Texas Tech University (2), Texas A&M University (1), Colorado State University (1), as well as the USDA Grazinglands Research Laboratory (3), USGS Fort Collins Science Center (1), and Great Plains Landscape Conservation Cooperative (1). This set of participants included different ethnicities, were split equally between female and male trainees, represented 20 different disciplines, and were at various stages in their career – Masters (5), Ph.D. (9), Postdoc (5), and early career researcher/environmental professional (4).

The one-week training consisted of a series of instructional presentations organized into themed sessions, two keynote addresses by nationally/internationally renowned figures to provide a broader perspective of stakeholder-based climate science research, a small group interdisciplinary activity, and field trips relevant to showcasing how scientific results are used in the decision-making process. The agenda is summarized below and provided in full in a separate document (Agenda_2016.pdf) and a list of the training instructors can be found in Instructor_List_2016.pdf.

Day 1 (evening)

- Keynote Address #1: Dr. William Hooke, Senior Policy Fellow at the American Meteorological Society – Early career professional development, science/policy interface

Day 2

- Introduction to SC CSC, its partner members, and its context within the U.S. Dept. of Interior
- Keynote Address #2: Dr. Kater Hake, Cotton Inc. Research Coordinator – Agricultural challenges and climate & co-production of science/stakeholder engagement
- Science Communication

Day 3

- Field Trip – Lubbock Lake Landmark Site
- Climate Science (paleoclimate, global climate modeling, regional downscaling)

Day 4

- Climate change impacts (health)
- Field Trip – USDA Cropping Systems Research Laboratory
- Stakeholder engagement
- Field Trip – Ranching Heritage Center
- Indigenous knowledge and climate change
- Professional development (proposal writing)

Day 5

- Stakeholder engagement
- Field Trip – Local vineyards

Day 6

- Climate change impacts (infectious disease)
- Professional development (proposal writing)
- Small group development activity wrap up

6. PROJECT RESULTS:

As stated in Section 3, the major result of this project was the development of a cohort of early career professionals who can continue networking through their research pathways and who can understand and eventually lead outcome-oriented, interdisciplinary research. The participants themselves deemed the training as extremely successful with an abundance of positive comments and feedback. Evaluation forms (completed by all 23 participants) contained high marks as summarized in Table 1. Participants provided high praise in the written feedback portion which can be summarized by the following selected responses. Participant A: "What a fantastic week of training, learning, and genuine enthusiasm and support for our group. That you were willing to share that kind of time with a group of early career researchers, and put together an outstanding group of speakers to boot, is amazing. I came away inspired, and with new skills and tips and knowledge that have already been useful. I've raved about the training to the post docs here, and told them to keep an eye out for the next round." Participant B: "I want to thank you all for organizing such an eventful and thought-provoking week of activities … Engaging with stakeholders, drafting NSF proposals, and collaborating with early career professionals from diverse fields of climate science provided me with a deeper well of knowledge about the possibilities post grad school. The enthusiasm each of you brought to the workshop was felt by

all of us in attendance. In particular, I appreciated the time you all took to listen and offer guidance for working in a multidisciplinary context." Participant C: "Last week was a wonderful experience for an Early Career scientist and I wanted to thank you all again. Two weeks ago, my advisor asked me why I wanted to get a PhD, and this week solidified and strengthened my want to continue my education." Additional interview responses from training attendees can be found in this short video (https://youtu.be/H71ni3a9LcI).

Table 1: Participant evaluation form scores (out of 5.0) as completed by all 23 participants.

CATEGORY	SCORE
Instructor Presentations	4.5
Small Group Activities	4.2
Field Trips	4.4
Facilities / Location	4.6
Organization	4.5
Usefulness	4.6
Hotel	4.9

The first main deliverable generated from this training is a set of digitally recorded presentations (refer to Instructor_Video_Presentation_2016.pdf) which include key presentations on the science/policy interface, co-production of science, stakeholder engagement, science communication, climate change science and impacts as well as cutting-edge research underway across the region and recent advancements at the national and international level. These recorded presentations not only will give participants a resource to revisit as they continue their research but also will provide non-participants, future students and post-docs, and stakeholders across the region (e.g., natural resource management organizations) an opportunity to learn about the SC CSC enterprise and innovative research taking place across the region.

The second main deliverable generated was an updated "how to" guide based on the guide created from the 2014 training that provides lessons learned on developing and implementing an early career researcher-based training, including integrating educational sessions on interdisciplinary topics with the exploration of collaborative research in an informative and fruitful manner (refer to How_To_Guide_2016.pdf).

7. ANALYSIS AND FINDINGS:

The project team accomplished its goals and objectives through extensive preparation, a strong commitment to the training attendees during the training, creating specific deliverables to extend the training lessons beyond the one-week period. The early career training developed for this project was found to be an excellent means for facilitating interdisciplinary interactions, fostering collaborative opportunities, and aiding in the professional development of researchers in the early stages of their career. While not necessarily "innovative," the project team made a concerted effort to develop an open, safe, collegial environment for the early career researchers to network and ask questions. This effort was aided by providing social time throughout the week and strongly encouraging all attendees to participate. As a result, the researchers bonded

quickly and continue their networking even after only one week together during June. A social media group has been formed with attendees keeping in contact with one another.

The project team updated the "how to" guide from the 2014 training (see How_To_Guide_2016.pdf) that can serve as a "best practices" for those wanting to conduct a similar professional development training.

In terms of management applications, the new round of digitally recorded presentations can be a valuable resource for end users across the region (e.g., managers, stakeholders, or farmers; and federal, state, Tribal, or local agencies or other private and non-governmental entities) to learn about the SC CSC enterprise and the innovative research being conducted. Also, it is anticipated that this experience will help the early career participants better understand the unique challenges that natural and cultural resource managers and other stakeholders face when conducting and developing their own outcome-oriented, interdisciplinary research – providing more useful and applicable results to the end user community.

8. CONCLUSIONS AND RECOMMENDATIONS:

There are six main recommendations that our team has after conducting this training as well as the 2014 training, with a number of other recommendations and useful information for holding a similar training in the "how to" guide (see How_To_Guide_2016.pdf). The first recommendation is to include end users within the activities throughout the training (e.g., managers, stakeholders, or farmers; and federal, state, Tribal, or local agencies or other private and non-governmental entities) so participants better understand the unique challenges that natural and cultural resource managers and other stakeholders face. Our training participants highly valued these interactions. The second recommendation is to separate early career researchers into different levels – Masters/Ph.D. graduate students and postdocs/early career professionals (Ph.D.'s may also be included) – and either focus the training on one of these groups or hold two parallel tracks with mostly independent sessions combined with a few that are overlapping. We found that while including such a large spectrum of early career stages had a number of benefits (e.g., mentoring/learning opportunities), it was challenging to develop content able to interest and benefit everyone. The third recommendation is to have communication, economic, and social science disciplines involved with the natural and physical sciences throughout the training. These are challenging to integrate into a researcher's thinking unless they have an opportunity early in their careers to see the importance of these fields. The fourth recommendation is to provide opportunities to socialize outside of the training activities (e.g., at the hotel in the evening or a local restaurant) so participants have additional networking opportunities in a more informal setting. We felt having this additional social time opportunity led to much of the success of the training. The fifth recommendation is to mix up classroom lectures with other activities outside the classroom such as field trips or small group activities. A good variety of activities throughout the day keeps the participant's minds fresh and more likely to become engaged with a given portion of the training. And a final recommendation is that these types of trainings should aim to create an "optimal" experience that takes into account the full range of participant backgrounds. Some participants will really like what other participants really dislike. There's really no way to make the "perfect" experience for all – aiming for "optimal" is the best we can do.

9. OUTREACH:

PI Rosendahl will present on this training during an education-related session at the 2017 American Meteorological Society's Annual Meeting. It also is anticipated that a publication will be produced based on the training in an appropriate journal, such as *EOS, Transactions American Geophysical Union* or *BioScience*. The College of Arts and Sciences at TTU also developed a write up on the event that was displayed on the College website and information sent out to alumni from the college on their event and training. Additional information is also available from the TTU-CSC website for future consideration. The USDA facility is looking to also follow up with their own training using the format developed from the training outlined here.

After closed captioning of the video is completed, it will be posted on the SC CSC web site at http://southcentralclimate.org and Facebook page at https://www.facebook.com/SouthCentralCSC as well as being distributed to the USGS for their public relations distribution.